Geophysical Research Abstracts
Vol. 16, EGU2014-3639, 2014
EGU General Assembly 2014

Top-down control of methanotrophs regulates methane concentrations in a small humic lake

Jatta Saarenheimo, Shawn Devlin, Jari Syväranta, Marja Tiirola, and Roger Jones
University of Jyväskylä, Department of Biological and Environmental Science, Finland (jatta.saarenheimo@jyu.fi)

Many boreal lakes are known to be significant sources of methane (CH_4), as methane production in anaerobic layers of boreal stratified lakes often exceeds oxidation of methane by methanotrophs, leading to methane fluxes to the atmosphere. In order to investigate whether trophic interactions control methanotrophy via regulation of bacterial community dynamics, we experimentally divided a small, humic, and fishless lake with high zooplankton abundance into two treatment basins. We then established either a) equal biomass of juvenile ($<$3 cm) and adult ($>$12 cm) European perch (*Perca fluviatilis*) or b) adult fish and no fish in the two basins. We hypothesized that differences in predator presence and size would result in cascading trophic interactions, altering the abundance of zooplankton (*Daphnia* sp.) which are known to graze methanotrophic bacteria. Concurrently with zooplankton abundance and methane concentration measurements, methanotrophic bacterial abundance was assessed by quantitative PCR by targeting specific functional genes (*pmoA)*. Fish presence, regardless of size, exerted high grazing pressure on zooplankton dramatically reducing their biomass. This shift in zooplankton density resulted in corresponding changes in methanotrophic bacterial abundance. We found a clear difference between epilimnetic methane concentrations for each treatment during the experiment, whereas the hypolimnetic methane concentrations showed no differences. The observed variation in epilimnetic methane concentrations was clearly linked to methanotrophic abundance/activity, which, in turn, was regulated by *Daphnia* biomass. This illustrates that cascading trophic interactions can be important regulators of methane concentration in stratified humic lakes and that previously unrelated ecological properties, fish abundance and atmospheric greenhouse gas concentrations, appear to be linked.